

WHAT IS CLAIMED IS:

1 1. A LED of AlGaInP system, comprising:
2 a substrate having conductivity,
3 a n-type cladding layer formed of compound semiconductor
4 of AlGaInP system,

5 an active layer formed of compound semiconductor of AlGaInP
6 system having a smaller band gap energy than that of said n-type
7 cladding layer,

8 a p-type cladding layer formed of compound semiconductor
9 of AlGaInP system having a larger band gap energy than that of
10 said active layer,

11 a p-type window layer formed of GaP,
12 electrodes formed on predetermined portions of said window
13 layer and said substrate, and

14 an insertion layer which is inserted between said p-type
15 cladding layer and said p-type window layer and has a smaller
16 band gap energy than that of said p-type cladding layer.

1 2. A LED of AlGaInP system according to claim 1, wherein:
2 said band gap energy of said insertion layer is larger
3 than that of said active layer.

1 3. A LED of AlGaInP system according to claim 1, wherein:
2 a conductivity type of said insertion layer is p-type.

1 4. A LED of AlGaInP system according to claim 3, wherein:
2 concentration of carriers in said p-type insertion layer
3 is $5 \times 10^{17} \text{ cm}^{-3}$ to $5 \times 10^{18} \text{ cm}^{-3}$.

1 5. A LED of AlGaInP system according to claim 1, wherein:
2 said insertion layer is lattice-matched with said p-type

3 cladding layer.

1 6. A LED of AlGaInP system according to claim 1, wherein:
2 said insertion layer is formed of AlGaInP, GaInP, AlInP,
3 GaAs, AlGaAs, GaAsP or InGaAsP, which has such a composition
4 that said band gap energy thereof is smaller than that of said
5 p-type cladding layer.

1 7. A LED of AlGaInP system comprising:
2 a substrate having conductivity,
3 a n-type cladding layer formed of compound semiconductor
4 of AlGaInP system,

5 an active layer formed of compound semiconductor of AlGaInP
6 system having a smaller band gap energy than that of said n-type
7 cladding layer,

8 a p-type cladding layer formed of compound semiconductor
9 of AlGaInP system having a larger band gap energy than that of
10 said active layer,

11 a window layer formed of $Ga_xIn_{1-x}P$ ($0 < x \leq 1$), $Al_yIn_{1-y}P$ ($0 < y$
12 ≤ 1) or $Al_zGa_{1-z}P$ ($0 < z \leq 1$),

13 electrodes formed on predetermined portions of said window
14 layer and said substrate, and

15 an insertion layer which is inserted between said p-type
16 cladding layer and said window layer and has a smaller band gap
17 energy than that of said p-type cladding layer.

1 8. An epitaxial wafer for a LED of AlGaInP system,
2 comprising:

3 a substrate having conductivity,

4 a n-type cladding layer formed of compound semiconductor
5 of AlGaInP system,

an active layer formed of compound semiconductor of AlGaInP system having a smaller band gap energy than that of said n-type cladding layer,

a p-type cladding layer formed of compound semiconductor of AlGaInP system having a larger band gap energy than that of said active layer,

a p-type window layer formed of GaP, and

an insertion layer which is inserted between said p-type cladding layer and said p-type window layer and has a smaller band gap energy than that of said p-type cladding layer.

9. An epitaxial wafer for a LED of AlGaInP system according to claim 8, wherein:

said band gap energy of said insertion layer is larger than that of said active layer.

10. An epitaxial wafer for a LED of AlGaInP system according to claim 8, wherein:

a conductivity type of said insertion layer is p-type.

11. An epitaxial wafer for a LED of AlGaInP system according to claim 10, wherein:

concentration of carriers in said insertion layer is $5 \times 10^{17} \text{ cm}^{-3}$ to $5 \times 10^{18} \text{ cm}^{-3}$.

12. An epitaxial wafer for a LED of AlGaInP system according to claim 8, wherein:

said insertion layer is lattice-matched with said p-type cladding layer.

13. An epitaxial wafer for a LED of AlGaInP system according to claim 8, wherein:

said insertion layer is formed of compound semiconductor

4 of AlGaInP, GaInP, AlInP, GaAs, AlGaAs, GaAsP or InGaAs, which
5 has such a composition that said band gap energy thereof is smaller
6 than that of said p-type cladding layer.

1 14. An epitaxial wafer for a LED of AlGaInP system
2 comprising:

3 a substrate having conductivity,

4 a n-type cladding layer formed of compound semiconductor
5 of AlGaInP system,

6 an active layer formed of compound semiconductor of AlGaInP
7 system having a smaller band gap energy than that of said n-type
8 cladding layer,

9 a p-type cladding layer formed of compound semiconductor
10 of AlGaInP system having a larger band gap energy than that of
11 said active layer,

12 a window layer formed of $Ga_xIn_{1-x}P$ ($0 < x \leq 1$), $Al_yIn_{1-y}P$ ($0 < y$
13 ≤ 1) or $Al_zGa_{1-z}P$ ($0 < z \leq 1$), and

14 an insertion layer which is inserted between said p-type
15 cladding layer and said window layer and has a smaller band gap
16 energy than that of said p-type cladding layer.

1 15. A LED of AlGaInP system, comprising:

2 a substrate having n-type conductivity,

3 *Sub 21* a n-type cladding layer formed of compound semiconductor
4 of AlGaInP system,

5 an active layer formed of compound semiconductor of AlGaInP
6 system having a smaller band gap energy than that of said n-type
7 cladding layer,

8 a p-type cladding layer formed of compound semiconductor
9 of AlGaInP system having a larger band gap energy than that of

10 said active layer,
11 a p-type window layer, and
12 an insertion layer formed of compound semiconductor of
13 AlGaInP system which is inserted into said p-type cladding layer
14 or between said p-type cladding layer and said p-type window
15 layer,
16 wherein said insertion layer is lattice-matched with said
17 p-type cladding layer, and a composition ratio of Al in said
18 insertion layer is lower than that in said p-type cladding layer
19 and higher than that in said active layer.

1 16. A LED of AlGaInP system according to claim 15, wherein:
2 said p-type window layer is formed of GaP.

1 17. A LED of AlGaInP system according to claim 15, wherein:
2 said p-type cladding layer and said p-type window layer
3 are doped with Zn.

1 18. A LED of AlGaInP system according to claim 15, wherein:
2 concentration of carriers in said insertion layer is
3 $2 \times 10^{17} \text{ cm}^{-3}$ to $5 \times 10^{18} \text{ cm}^{-3}$.

4 19. An epitaxial wafer for a LED of AlGaInP system,
5 comprising:

6 a substrate having n-type conductivity,

7 a n-type cladding layer formed of compound semiconductor
8 of AlGaInP system,

9 an active layer formed of compound semiconductor of AlGaInP
10 system having a smaller band gap energy than that of said n-type
11 cladding layer,

12 a p-type cladding layer formed of compound semiconductor
13 of AlGaInP system having a larger band gap energy than that of

14 said active layer,
15 a p-type window layer, and
16 an insertion layer formed of compound semiconductor of
17 AlGaInP system which is inserted into said p-type cladding layer
18 or between said p-type cladding layer and said p-type window
19 layer,

20 wherein said insertion layer is lattice-matched with said
21 p-type cladding layer, and a composition ratio of Al in said
22 insertion layer is lower than that in said p-type cladding layer
23 and higher than that in said active layer.

1 20. An epitaxial wafer for a LED of AlGaInP system according
2 to claim 19, wherein:

3 said p-type window layer is formed of GaP.

1 21. An epitaxial wafer for a LED of AlGaInP system according
2 to claim 19, wherein:

3 said p-type cladding layer and said p-type window layer are
4 doped with Zn.

1 22. An epitaxial wafer for a LED of AlGaInP system according
2 to claim 19, wherein:

3 concentration of carriers in said insertion layer is
4 $2 \times 10^{17} \text{ cm}^{-3}$ to $5 \times 10^{18} \text{ cm}^{-3}$.

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